BIBLIOGRAPHICAL NOTICES.

The Study of Animal Life. By J. Arthur Thomson, M.A. &c., Lecturer on Zoology, School of Medicine, Edinburgh. London: John Murray, 1892.

This little volume of some 370 pages forms one of the University Extension Manuals edited by Prof. Knight, who states in a preface that the series is intended "to supply the need so widely felt by students, of text-books for study and reference, in connexion with the authorized courses of lectures. The Manuals differ from those already in existence in that they are not intended for school use or for examination purposes; and that their aim is to educate, rather than to inform." Admitting that there is a need for such a series of volumes—and the objects as set forth in the editorial preface are certainly very laudable—let us consider how far Mr. Thomson's work fulfils the requirements of the case.

The book is divided into four parts and twenty chapters. Its scope will be to some extent realized from the headings of the parts, which are (I.) The Everyday Life of Animals; (II.) The Powers of Life; (III.) The Forms of Animal Life; and (IV.) The Evolution of Animal Life. There are in addition two appendices entitled respectively "Animal Life and Ours" and "Some of the Best Books on Animal Life." These headings give but a very imperfect notion of the contents of the volume, which attempts to cover the whole ground of animal biology. The scope in fact is so wide that the treatment is and could not be otherwise than sketchy. The reader who peruses the pages with the object of assigning to the work its correct place in biological literature will experience the same difficulty that we have met in deciding whether the author is aiming at popularity or whether he is endeavouring to supply an elementary text-book with all the technicalities of the science cut out. Whatever his aim, the result on the whole is, it must be confessed, somewhat disappointing. The book is not popular enough in our opinion to convert a would-be student into a biologist, while it is too sketchy to be of much real use to an earnest reader. It is unfortunately one of those productions which are calculated to spread broadcast throughout educated classes the glib patter of the scientific workshop which superficially passes for real knowledge. This is no doubt very far from the author's intention; but the effect cannot be otherwise when in the course of one small volume the reader is conducted over the whole range of subjects referred to in the contents, that is, the entire field of animal biology, including morphology, embryology, physiology, psychology, sociology, &c.

The defects which have been pointed out are to a very great extent, or perhaps entirely, due to the system for which Mr. Thomson has undertaken to cater. Making allowances for the work from this point of view it must be admitted that there are certain sections here and there which indicate considerable originality, and which show

that the author is capable of doing good service to biological science as a thinker under more favourable conditions than those imposed by University Extension lecturing. As a specimen of judicious treatment we may refer to the summing-up of the cell-theory in the chapter on "The Elements of Structure" (p. 183):—

"We study the nucleus, first as a simple unit which divides, years afterwards as composed of a network or coil of nuclear threads which seem ever to become more and more marvellous, 'behaving like little organisms.' We split these up into 'microsomata' and so on, and so on. But we do not catch the life of the cell, we cannot locate it, we cannot give an account of the mechanics of cell-division. It is a mystery of life. After all our analysis we have to confess that the cell, or the protoplasm, or the archoplasm, or the chromatin threads of the nucleus, or the 'microsomata' which compose them baffle our analysis; they behave as they do because they are alive."

The tabular summaries, such as those showing the characteristics of animals and plants (p. 170), the survey of the animal kingdom (p. 272), the tree of life (p. 12), the summary of evolution theories (p. 302), &c. are also worthy of commendation.

As a fair average sample of the author's method we give the following extract from his treatment of the resemblances and differences between animals and plants (p. 171):—

"The net result of this contrast is that animals are more active than plants. Life slumbers in the plant; it wakes and works in the animal. The changes associated with the living matter of an animal are seemingly more intense and rapid; the ratio of disruptive power-expending changes to constructive power-accumulating changes is greater; most animals live more nearly up to their income than most plants do. They live on richer food; they take the pounds which plants have accumulated in pence, and spend them. Of course plants also expend energy, but for the most part within their own bodies; they neither toil nor spin. They stoop to conquer the elements of the inorganic world, but have comparatively little power of moving or feeling. They are more conservative and miserly than the liberally spendthrift animals, and it is possible that some of the most characteristic possessions of plants, *e. g.* cellulose, may be chemical expressions of a marked preponderance of constructive and upbuilding vital processes. It is enough, however, if we have to some extent realized the commonplaces that plants and animals live the same sort of life, but that the animals are on an average more active and wide-awake than the plants."

We have already pointed out the general meagreness of the treatment given to the different portions of the work, necessitated by the compression of a very wide subject into a very small compass. An example will serve to indicate the defect to which we allude. Chapter IX. is headed "The Divided Labours of the Body." As subheadings appear the following:—1. Division of Labour. 2. The Functions of the Body: Movement; Nutrition; Digestion; Absorption; The Work of the Liver and the Kidneys; Respiration; Circulation; The Changes within the Cells; The Activities of the Nervous System. 3. Sketch of Psychology.

Here are materials for complete works on physiology and psychology. *The whole of these subjects are disposed of in nine pages!* Really scientific men may fairly ask what manner of use this kind of instruction serves.

Quite apart from these graver sins of compression, for which, as we have said, the author is not altogether responsible, there are certain minor blemishes which it is our duty to point out. In the first place, we are of opinion that the plan of giving quotations from other works without indicating their origin is most objectionable. The only effect which this can produce upon the mind of the student is that the author has either failed in power of expression, or that he is giving the actual words of some writer whom he regards as an authority. The latter is no doubt the true state of the case; but the reader is in many instances left quite in the dark as to the source of Mr. Thomson's inspiration—he is only allowed to infer that the words are not the author's by being suddenly plunged into a sentence between inverted commas. This occurs many times throughout the work. Thus, for all the student can gather, the passages quoted on p. 52 might be from Poulton or from any other author; the quotation referring to Joule on p. 131 has apparently dropped in promiscuously from some source known to the author but carefully hidden from his readers. Examples of this defect might be multiplied did space permit.

Then, again, the style occasionally lapses from the scientific to the metaphysical, to the everlasting confusion of the student. Under the heading "Vitality" (Chap. VIII.) and the subheading "The Task of Physiology" (p. 126) we read as follows:—

"Thus the star-like crystals of a snowflake, the diamond drops of dew, the overshadowing mountains, would all be imaged in our minds as living, though of more lowly life than the lichens of the bare hill-tops, the grass of the plains, or man himself."

Again, on p. 142, under the subheading "Origin of Life":—

"Matter in motion is accompanied by consciousness in ourselves. We infer a similar consciousness in creatures like ourselves. As the movements and the matter differ from those that occur within our body, so will the accompanying consciousness. The simplest state of affairs or 'body' we can imagine is that of a gas such as hydrogen. But such a simple state of matter may have its accompanying consciousness, as different from ours as is the structure of our bodies from that of a hydrogen molecule. This is of course also an assumption, but it is one that harmonizes with the facts of experience."

We question the advisability of introducing fragments of German metaphysics into an elementary manual intended for students attending a University Extension course on animal life. Many other mystical passages have been noted during our perusal of the book, but it is unnecessary to quote any further illustrations.

In matters of fact the author is, on the whole, fairly accurate, and there are but few statements to which exception can be taken. Among the errors we have noticed may be pointed out the state-

ment on p. 28 that Darwin prophesied the existence of a *butterfly* in Madagascar with a proboscis 11 inches long; that "the only ugly animals are the products of domestication and human interference on the one hand, or of disease on the other" (p. 17); and that the term "balance of nature" is "very generally used to describe the mutual dependence of plants and animals" (p. 19). Further, Seitz's observations on the general tendency of the insects in a certain Brazilian region to become blue, and in an adjacent region red, have nothing whatever to do with the question of "resemblance to surroundings" (p. 49). Is the statement on p. 313, that all the annual progeny from one Aphis, if they survived and multiplied at the same rate as the parent, "would weigh down 500,000,000 stout men," the result of an actual calculation or simply a metaphorical way of stating that they would weigh a large number of pounds? If it is numerically true, the details of the calculation should be given. Taking the weight of a "stout man" as 150 lb., it will be found that the total Aphis progeny according to the above figures would weigh 33,482,143 tons.

Among the most favourable specimens of the author's power of exposition is the chapter on Heredity (Chap. XX. p. 320), in which the main facts and principles of this all-important subject are discussed and presented in a very lucid manner. The Darwinian doctrine is herein rejected in the following terms:—

"I am certainly unable to reconcile myself to the opinion that the progress of life is due to the action of natural selection on fortuitous, indefinite, spontaneous variations.

"I believe that the conclusion of the whole matter should be an emphatic 'not proven' on either side, while the practical corollary is that we should cease to talk so much about possibilities (in regard to which one opinion is often as logically reasonable as another), and betake ourselves with energy to a study of the facts."

No doubt this is sound advice; but it is remarkable that the author, who is sceptical with regard to natural selection, should declare with respect to the far more obscure problem of the origin of life (p. 136) that "the first stuff that was complex and unstable enough to be properly described as living was almost certainly formed in water, long ago, when the conditions of greater heat, and consequently greater mobility of all substances, made chemical changes more active."

The list of "best books" which the student is referred to in Appendix II. is simply appalling; we think some judicious pruning is required here, unless some means can be found for considerably prolonging the life of the biologist of the future.

We regret that we are unable to recommend this new work of Mr. Thomson's in higher terms; it is not altogether without merit, but it is fanciful in parts and occasionally mystical to the verge of incomprehensibility. The would-be student of animal life will find himself better off if he selects a few of the "best books" recommended by the author.